Exhibit 8

INTANGIBLE CAPITAL ASPECTS OF
ADVERTISING AND R&D EXPENDITURES

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Twenty years have passed since economists first emphasized the "intangible capital" aspects of advertising. According to this view, ". . . consumers tend to forget brands and continuous advertising is needed to maintain a given rate of sales. Thus, advertising expenditures can be viewed as a capital good that depreciates over time and needs maintenance and repair [22, p. 197]." More recently, Weiss [25], among others, has suggested that research and development, R&D, costs might also be capitalized as such expenditures ". . . yield benefits mainly in the future [25, p. 421]." Unfortunately, most analyses of the intangible capital issue have been limited to advertising largely because no comprehensive data on R&D were available until quite recently. However, important recent theoretical contributions on the topic and improvements in data availability now make it possible more completely to consider the intangible capital aspects of both advertising and R&D expenditures.

Here the intangible capital issue is investigated through use of a market valuation model. In this approach, significant future (intangible capital) effects of advertising and R&D are suggested to the extent that current expenditures have significant effects on the market value of the firm. Given positive market value influences, individual coefficient estimates can be used to estimate both the total stock of intangible capital as well as average annual depreciation rates for advertising and R&D. While these depreciation rate estimates are interfirm averages and undoubtedly err in individual instances, they can be quite useful in indicating the general magnitude of corporate profit and tax misstatement due to current reporting and tax policies.

In section I below, various articles closely related to this study are reviewed. Section II develops a valuation model embodying intangible capital considerations. The data are discussed in section III, and estimation results are presented in section IV. And finally, conclusions and implications for public policy are discussed in section V.

I. PREVIOUS STUDIES

Previous studies attempting empirically to define the magnitude of the long-lived aspects of advertising expenditures have focused on a distributed lag

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relationship between current product sales and advertising expenditures [see 5]. Results have been ambiguous. Peles [15] found significant future effects of advertising in beer and cigarettes, but not in automobiles. Abdel-Khalik [1], however, found evidence of long-lived effects for firms in food and in drugs and cosmetics, but *not* for tobacco and soap and cleansers firms. Schmalensee [20] examined the advertising effect on sales for both the cigarette industry as a whole and its individual firms and reported different effects for the various companies and for the industry in general. Like Schmalensee, Falk and Miller [8] also found nonuniform patterns of amortization of advertising expenditures for individual firms in the same industry. Brown [4] has concluded that such interfirm differences may be due, in part, to the age of the product promoted as the returns to promoting appear to be greater for new as opposed to older products. In reviewing previous studies, Picconi [17] found it troublesome that even among the most heavily advertised products, a systematic relationship between advertising and sales or market share cannot consistently be found. Even more discouraging than this finding, Clarke discovered that the average implied duration interval derived from annual data is more than 17 times as long as the average implied duration interval derived from monthly data! Needless to say, this conflicting body of empirical evidence has not resolved the policy question of whether to capitalize or expense advertising expenditures. These ambiguous results, however, are quite understandable if one considers various theoretical and empirical problems of previous methods. First, an almost exclusive emphasis has been placed upon an individual item's sales related or "product" advertising, while the importance of a firm's aggregate level of product and "institutional" advertising has been ignored. Certainly the product advertising for an individual item can be expected to have an important influence on its demand, but institutional advertising which is expected to improve the firm's image or aid the firm in its interactions with the public may also be important [see 18]. For example, the fact that "Body by Fisher" constitutes a "mark of excellence" undoubtedly contributes to the sales of the entire line of General Motors products. In a similar fashion, advertisements emphasizing the quality of Buick cars undoubtedly improve public perceptions of Chevrolet. Therefore, both institutional and product advertising might reasonably be expected to result in beneficial "spillover" effects. Such spillover effects will cause a weakening of the sales-product advertising relationship for an individual product and cause one to draw possibly erroneous conclusions regarding the importance and/or durability of advertising expenditures.

A second problem with previous methods is that they do not fully reflect the multipurpose goals of advertising. It is generally agreed that product advertising is an attempt to move the consumer from an unawareness of product existence, to a favorable attitude towards the product, to an eventual purchase decision—in other words, increase sales. On the other hand, institutional advertising may have quite different objectives. With institutional advertising the firm addresses the public not only as consumers or potential buyers of

its products, but also as voters on public policy issues important to the firm, as actual or potential shareholders, and as employees [18]. Rather than increasing sales, such advertising would seem directed towards reducing costs. Based on these observations, one might argue that the firm's overall objective in advertising is profit. It achieves this objective through sales related product advertising, and institutional advertising aimed at both increasing sales and reducing costs. To avoid measurement errors, analyses of advertising effectiveness must consider the complete body of intended effects.

A third difficulty with previous research is that only aggregate media expenditures are considered. This leaves possible differential media influences ignored. In designing an advertising program firms have a wide choice of media to choose among. Comanor and Wilson [6], Mueller and Rogers [14], and Porter [19] have all suggested that the mix of advertising media adopted by sellers will have important implications for the level of intangible advertising investment required for new firms ". . . to achieve parity with going firms [19, p. 401]." They argue that the advantages to advertisers over existing and potential competitors will be greater where the going firm competes and advertises nationally (as opposed to locally) because of the large sums required for national media, especially television, advertising. Importantly, Porter found greater profitability effects for television as opposed to other forms of media advertising. Thus, it seems that the possibility of differential media influences is well worth considering.

Statistical problems have presented a fourth problem for previous studies of advertising effectiveness. In particular, high multicollinearity between current and past levels of advertising expenditures has reduced the validity of techniques employed. In fact, Picconi concluded that the distributed lag approach is inappropriate for determining long-term advertising effectiveness. At a minimum, Clarke suggests that alternatives to the distributed lag models should be sought. He suggests that new approaches ". . . should (1) be more robust in the parameters which measure the cumulative advertising effect, (2) be derived from more realistic models of advertising effect, and (3) be less sensitive to data interval bias [5, p. 356]."

Finally, the understandable failure to consider research expenditures in previous studies of advertising creates the possibility of specification bias. In support of Weiss' early suggestion of intangible capital aspects of R&D expenditures, Grabowski and Mueller [9] found that R&D expenditures like advertising expenditures have a large and consistent positive effect on firm profit rates. With various depreciation rates of between 5 and 20 percent per year, they indicated after-tax returns on R&D of between 15 and 20 percent. Since such returns are significantly above average returns earned on tangible investments, support is gained for Comanor and Wilson's observation that intangible capital may have a substantial required rate of return as no tangible asset is created which may be sold in the event of failure. Therefore, there appears to be ample theoretical as well as empirical justification for considering the profitability influences of advertising and R&D expenditures jointly.

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Of course, failure to do so will tend to be most serious for firms in industries which are both advertising and R&D intensive (e.g., pharmaceuticals).

II. METHODOLOGY

Measuring Intangible Capital

Since potentially important advertising and R&D capital are of an intangible and *unobservable* nature, an econometric problem is encountered in measuring their empirical relevance. Given only modest assumptions, however, it can easily be shown that there is a strictly proportional relationship between observable advertising and R&D expenditures, and unobservable advertising and R&D capital. Earlier studies [15, 25] have assumed that advertising depreciation is of the "evaporation" variety, and is constant at a rate of, say, δ per cent per period. If a similar assumption may be made concerning R&D capital, then

$$(1a) \qquad IC_t = \sum_{i=0}^{\infty} (1-\delta)^i I_{t-i},$$

$$(1b) \qquad = (1-\delta)^0 I_{t-0} + \sum_{i=1}^{\infty} (1-\delta)^i I_{t-i},$$

$$(1c) \qquad = I_t + (1-\delta)IC_{t-1}.$$

Where I_t refers to advertising and R&D expenditure levels during period t, and IC_t is the total level of intangible advertising and R&D capital.

If $0 \leq \delta < |1$, then a portion of advertising and R&D expenditures in the current period will carry over to subsequent periods and constitute an investment in intangible capital. On the other hand, if $\delta = 1$, then advertising and R&D expenditures would have an influence during the current period only, and should be expensed rather than capitalized.

The effect of expenditure growth (net investment) over time can easily be incorporated into the analysis. Where advertising and R&D expenditures grow at a constant rate γ per cent per period, $I_t = I_0(1+\gamma)^t$.[1] Then, from equation (1a) we can write

$$(2a) \qquad IC_t = \sum_{i=0}^{\infty} (1-\delta)^i I_0(1+\gamma)^{t-i},$$

$$(2b) \qquad = \sum_{i=0}^{\infty} (1-\delta)^i I_t(1+\gamma)^{-i},$$

$$(2c) \qquad = I_t \sum_{i=0}^{\infty} \left(\frac{1-\delta}{1+\gamma}\right)^i,$$

[1] The assumption of a constant γ is made to simplify the analysis. Nevertheless, Weiss suggested that this assumption is "not wildly wrong in any case." In support of this assertion, Weiss reported a mean R^2 of .58 for logarithmic trends (log ads to time) for a sample of 32 IRS "minor industries."

and since $(1 - \delta)/(1 + \gamma) < 1$, we can apply the power series rule and simplify to yield

$$(2d) \qquad IC_t = I_t \; \frac{1}{1 - \left(\dfrac{1 - \delta}{1 + \gamma}\right)} \, ,$$

$$(2e) \qquad \quad = I_t \left(\frac{1 + \gamma}{\delta + \gamma}\right).$$

This equation identifies the constant and proportional relationship $IC_t = \beta I_t$, which exists between intangible capital and current levels of expenditures where $\beta = (1 + \gamma)/(\delta + \gamma)$.[2] It follows that both advertising and R&D capital will be proportionate to current advertising and R&D expenditures, i.e., $AC_t = \beta_{AD} AD_t$ and $RC_t = \beta_{R\&D} R\&D_t$. Importantly, amortization will only be appropriate should $\beta_i > 1$, since only then will $0 \le \delta_t < 1$.

Of course, the above findings are of interest because they allow us to consider the market value effects of current advertising and R&D expenditures as indicative of the market value implications of intangible capital. Our testable hypothesis becomes

$$(3a) \qquad MV_t = f(AC_t, \; RC_t, \; X_t),$$

$$(3b) \qquad \qquad = f(\beta_{AD} AD_t, \; \beta_{R\&D} R\&D_t, \; X_t).$$

where f represents the relationship between the market value of the firm, MV_t, advertising capital, R&D capital, advertising and R&D expenditures; and X_t, a vector of x_i important determinants of firm market value which are neither advertising nor R&D related. Because all variables relate to the current period only, the subscript t can be dropped below without confusion.

The Valuation Model

On a theoretical basis, the market value of the firm represents the future profit stream discounted to the present at an appropriate risk-adjusted rate of discount. On a practical basis, the market value of the firm is dependent upon various "indicators" of the firm's future profit potential. One such indicator is the level of firm investment in tangible capital. At any point in time this level will depend upon historical levels of investment, rates of physical and technological depreciation, current opportunity costs, etc. Obviously, measuring the current level of tangible capital investment involves both theoretical and practical problems. While realizing the problem of understatement during inflationary periods, the accounting book value of the firm's capital invest-

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[2] In a recent article Ben-Zion [2] asserted a similar proportional relationship, but one where $\beta = 1/(\delta + \gamma)$. This assertion is only valid, however, if γ can be considered "small" in relation to $\delta + \gamma$. In light of commonly observed γ's of .10 to .15 and previous estimates by Peles of δ's in the .35 to .50 range, Ben-Zion's assertion seems inappropriate.

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ment, BV, will be adopted here. Current profits, π, provides an additional important indicator of a firm's profit potential. It has been suggested by Thomadakis [23], for example, that in a capital market which evaluates all available information about the future profitability of the firm, market value will exceed the cost of investment to the extent that *ex ante* rates of return exceed competitive norms. Advertising and R&D expenditures will also constitute important determinants of firm market value to the extent that such expenditures result in the creation of an economically relevant amount of intangible capital. In order that the possibly differential market value effects of various media, particularly television advertising, may emerge, alternative aggregations of total advertising expenditures, AD_i, will be considered. In all cases

$$\sum_{i=1}^{n} AD_i = AD.$$

The above considerations suggest a basic valuation model of the following form:

$$(4) \qquad MV = \alpha_1 + \alpha_0 BV + \alpha_2 \pi + \alpha_3 R\&D + \sum_{i=1}^{n} \alpha_i AD_i + u$$

Direct estimation of such a form, however, would undoubtedly be hampered by both multicollinearity and heteroskedasticity problems as each variable is heavily influenced by characteristics related to firm size. If such influences can be taken as proportionate with size as measured by firm book value [e.g., see 13], we may write

$$(5) \qquad \frac{MV}{BV} = \alpha_0 + \alpha_1 \frac{1}{BV} + \alpha_2 \frac{\pi}{BV} + \alpha_3 \frac{R\&D}{BV} + \sum_{i=1}^{n} \alpha_i \frac{AD_i}{BV} + u^*$$

where $u^* = u/BV$ and as assumed to be homoskedastic.

The dependent variable MV/BV described above has an important economic interpretation when viewed as an approximation to "Tobin's q" ratio. Tobin's q is defined as the market value of the firm divided by the replacement cost value of total assets. Originally, Tobin proposed this measure as an indicator of a firm's propensity to invest in new plant and equipment [e.g., see 24]. According to Tobin, when $q > 1$ firms will expand total investment in order to increase the total economic residual earned by stockholders. Whereas $q > 1$ creates an obvious incentive for firm expansion, $q < 1$ creates an equally obvious incentive for firm contraction.

The use of approximations to Tobin's q in industrial organization is a fairly recent phenomena. Lindenberg and Ross [12], for example, have suggested that they can be most useful in indicating the extent to which stockholders capitalize rents attributable to invested capital, firm-specific factors and market power. While this analysis focuses on the roles played by advertising

and R&D expenditures as firm-specific factors affecting the MV/BV ratio, such influences cannot be considered in isolation. To a degree, equation (5) allows for the effects of invested capital and market power through the 1/BV and π/BV variables. Because this allowance is imperfect at best, it seems quite reasonable to offer an expanded valuation model which more explicitly deals with the effects of invested capital and market power.

Clearly, historical rates of return not only reflect the effects of market power, but also the effects of past investment decisions and firm-specific factors as well. Nevertheless, when analyzing data for widely diversified firms, rates of return can capture market power influences partially obscured by primary product or weighted average concentration ratios. Concentration ratios for a firm's primary product industry are only a poor measure of market power at the firm level because many firms operate in several industries, with primary product sales often representing less than 50 percent of a firm's total. Even weighted concentration ratios reflecting firm involvement in a number of industries can fail to capture market power influences since critical concentration ratio considerations are neglected. Of these problems associated with mapping industry concentration and firm operating data, those associated with diversification seem most serious. Despite these limitations, the effects of a firm's weighted four-firm concentration ratio, CR, will be considered as an additional important indicator of market power influences on the value of the firm. Some collinearity problems are obvious, but unavoidable.

In addition to dealing with estimation problems concerning the effects of market power, it seems reasonable to address measurement errors related to the use of accounting data. A potential method for dealing with differences among firms in the impact of inflation on accounting book values is to consider the effect of growth, GR, on market value. It seems reasonable that rapidly growing firms will have newer plant and equipment whose book values more closely correspond with economic values than do the book values of less dynamic firms with older tangible investment. One might expect, therefore, that GR will have a negative "accounting" effect in regressions where BV is also entered. Confounding this influence, however, is the fact that past growth rates are undoubtedly used by investors to form expectations concerning future growth in economic rents and rental opportunities. *A priori* it is difficult to predict whether the negative accounting effect will be overwhelmed by positive "signalling" effects. Because such influences can tend to cancel one another out, the net effect of GR on market value is uncertain.

And finally, in considering the market value effects of invested capital, firm-specific factors and market power it is necessary to control for the expected level of investor risk. While investor risk is often measured in terms of stock-price beta, Ben-Zion and Shalit [3] present an attractive alternative based upon the Standard & Poor's ranking of earnings and dividend stability where $A+$, A, . . . D, NR is translated into a numerical scale 1, 2, . . . 8, 9.

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Ben-Zion and Shalit found this measure attractive as it reflects the assessment of risk by investment agencies and other practitioners operating in the stock market. Because required rates of return can be expected to rise as the risk, R, of the anticipated profit stream increases, the discounted present (market) value effect of increased R will be negative.

Therefore, the valuation model which will be tested below in an attempt to isolate the intangible capital effects of advertising and R&D expenditures can be written

$$(6) \qquad \frac{MV}{BV} = \beta_0 + \beta_1 \frac{1}{BV} + \beta_2 \frac{\pi}{BV} + \beta_3 CR + \beta_4 GR$$

$$+ \beta_5 R + \beta_6 \frac{R\&D}{BV} + \sum_{i=1}^{n} \beta_i \frac{AD_i}{BV} + e$$

where it is expected that β_2, β_3, β_6, $\beta_i > 0$; $\beta_5 < 0$; while β_1 and β_4 are uncertain.

III. THE DATA

In developing an appropriate sample it would seem desirable to include firms which both do and do not spend substantial amounts on advertising and R&D. With this consideration in mind, the *Fortune* 500 for 1977 was adopted as a sample basis for this study. Several observations had to be dropped due to missing or incomplete data. Complete data were obtained on a representative sample of 390 firms from 12 major product groups. Approximately $5.0 billion in national media advertising and $15.2 billion in R&D expenditures were undertaken by sample firms. Not surprisingly, this sample provides a better coverage of total R&D expenditures (87.3 percent) than of national media advertising (23.9 percent).[3] Nevertheless, coverage of both is quite high. Six categories of national media advertising are covered, including: network television, spot television, newspaper, magazine, radio and outdoor billboard advertising. This level of media aggregation will prove quite useful in testing for media differences in valuation effects. In particular, previous studies suggest lower rates of depreciation for television advertising since targeted audiences tend to be geographically stable.

Accounting data on net income, sales and the book value of total assets were all obtained from *Fortune*. Interest expenses were added to net income in order to construct a profit variable which reflects returns to all holders of firm securities. Interest expense data were obtained from Standard and Poor's

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[3] The *Fortune* 500 excludes retailers, for example, many of whom (Sears, McDonalds, etc.) are major advertisers.

Compustat tapes. Four-firm concentration ratios weighted to reflect firm sales in various four-digit census industries were originally compiled by Economic Information Systems (EIS) Inc. and generously made available to this study by Kenneth M. Harlan. Unfortunately, while all firm data relate to 1977, the latest census data available at the time this analysis was undertaken were for 1972. Thus, weighted census concentration ratios used here are largely for 1972. In some instances, classification problems required the use of 1967 data. While it would obviously be preferable to use concentration data for 1977, concentration ratios are highly correlated over time and any reduction in the market value effects of concentration due to measurement errors should be minimal. And finally, all advertising data had *Leading National Advertisers* as its source, while R&D expenditures were obtained from *Business Week*. Individual variables are defined as follows:

MV/BV
    is market value deflated by book value calculated as the ratio of the market value of common plus book value of debt all divided by the book value of total assets.

1/BV
    is deflated book value calculated as the inverse of the book value of total assets.

π/BV
    is profitability calculated as net income plus interest expense all divided by the book value of total assets.

CR
    is concentration calculated at the four-firm level and weighted to reflect firm involvement in various four-digit census industries.

GR
    is growth in terms of sales calculated as $\sqrt[5]{S_{1977}/S_{1972}} - 1$.

R
    is risk as reflected by earnings and dividend stability where $A+, A \ldots D$, NR is translated into a numerical scale $1, 2, \ldots 8, 9$.

R&D/BV
    is R&D expenditures deflated by book value and is calculated as the ratio of R&D expenditures divided by the book value of total assets.

AD/BV
    is advertising expenditures deflated by book value and is calculated as the ratio of total national media advertising divided by the book value of total assets.

A correlation matrix for the variables described above is included in Table I. Correlations for the television, TV, and nontelevision, NTV, portions of total advertising are also reported as these variables are also included in the analysis below.

IV. ESTIMATION RESULTS

Ordinary least squares results for equation (6) using two different levels of aggregation for advertising expenditures are reported in Table II. In equation

TABLE I
VARIABLE CORRELATION MATRIX

	MV/BV	1/BV	π/BV	CR	GR	R	R&D/BV	AD/BV	TV/BV	NTV/BV
MV/BV	1.000									
1/BV	−.063	1.000								
π/BV	.627	.041	1.000							
CR	.068	−.258	.030	1.000						
GR	.252	−.136	.297	.084	1.000					
R	−.511	.298	−.502	−.031	−.366	1.000				
R&D/BV	.317	−.134	.213	.279	.106	−.149	1.000			
AD/BV	.331	−.010	.248	.077	.006	−.231	.055	1.000		
TV/BV	.345	−.015	.261	.070	.023	−.226	.071	.965	1.000	
NTV/BV	.125	.009	.086	.060	−.049	−.131	−.027	.613	.384	1.000

TABLE II
ESTIMATION RESULTS: INTANGIBLE CAPITAL AS-
PECTS OF ADVERTISING AND R&D EXPENDITURES
($n = 390$)

	Dependent Variable is MV/BV	
	Eq. 6a	Eq. 6b
Constant	0.781	0.790
	(9.28)*	(9.35)*
1/BV	3.141	3.553
	(0.33)	(0.38)
π/BV	4.456	4.413
	(9.49)*	(9.37)*
CR	−0.041	−0.035
	(−0.40)	(−0.34)
GR	0.148	0.133
	(0.63)	(0.57)
R	−0.055	−0.056
	(−4.85)*	(−4.92)*
R&D/BV	3.145	3.091
	(4.84)*	(4.75)*
AD/BV	2.732	...
	(4.32)*	
TV/BV	...	3.307
		(4.19)*
NTV/BV	...	0.030
		(0.01)
R^2	.501	.503
F	54.79*	48.20*

Notes: t values in parentheses.
    * indicates significance at the $\alpha = .01$ level.

(6a), total advertising expenditures are entered. In equation (6b), these total advertising expenditures are divided into their television and non-television advertising components in order that intermedia influences might be evaluated.

Estimation results for the valuation model using total advertising expenditures indicate significant explanatory power for the aggregate advertising form of the valuation model (equation (6)). On the basis of individual coefficient estimates, current profit rates seem to constitute an important positive and highly significant determinant of the market value of the firm. As suggested above, such effects may have efficiency or market power related sources. Somewhat surprisingly, neither concentration nor growth had individually significant influences. These results should be interpreted cautiously, however, as they probably reflect measurement and collinearity problems rather than indicate an irrelevance of market power and growth related influences. Furthermore, as mentioned above, the accounting and signalling effects

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of growth rates on market values can tend to offset one another. Risk has the expected negative and significant effect. This finding supports use of the Ben-Zion and Shalit variable as an empirically relevant descriptor of risk.[4]

Quite robust results for the effects of advertising and R&D expenditures on market value were obtained. Here we find support for their treatment as intangible capital since each has a highly significant positive influence on market value. Indeed, we can reject the null hypothesis that each variable is less than one ($H_0 : \beta_i < 1$) at the $\alpha = .01$ level. As a result, each coefficient estimate ($\hat{\beta}_6$ and $\hat{\beta}_7$, respectively) has an important interpretation in economic terms since they can be used to derive advertising and R&D depreciation rate estimates for the *Fortune* sample.[5] In equation (2e) we concluded that $IC_t = \beta I_t$, where $\beta = (1 + \gamma)/(\delta + \gamma)$. It follows that $\delta = (1 + \gamma - \gamma\beta)/\beta$. Therefore, average depreciation rate estimates, δ's, for both R&D and advertising capital can be made using $\hat{\beta}_6$ and $\hat{\beta}_7$, given appropriate expenditure growth rate estimates, γ's. For a given coefficient estimate, low (high) $\hat{\gamma}$'s will result in high (low) δ's. Because δ's are sensitive to even small changes in $\hat{\gamma}$'s, the reader may wish to construct a range of δ's on the basis of various assumptions regarding "true" γ. Here historical rates of growth in nominal R&D and advertising expenditures are used to generate $\hat{\gamma}$'s. To the extent $\hat{\gamma}$'s are below (above) long-term growth rates, δ's will be above (below) long-term depreciation rates.[6] In light of recent growth rates for R&D expenditures of 8.8 percent over the 1974 to 1977 period (firm data were unavailable before 1974), an average depreciation rate for R&D of 25.8 percent per year is indicated. Similarly, recent growth in national media advertising of 12.3 percent per year over the 1972 to 1977 period indicates an average yearly rate of advertising depreciation of 28.8 percent. This estimate for advertising depreciation is in the middle of the range estimated in previous studies surveyed by Comanor and Wilson [7], while a R&D depreciation rate of roughly 25 percent per year is above Grabowski and Mueller's recent presumption of a 10 percent rate.

In order to consider possibly important media influences the valuation model was also estimated with total advertising divided into its television and non-television advertising components (equation (6b)). While both of the television and non-television components of national media advertising seem

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[4] Interestingly, estimation results for the variables of primary interest were quite insensitive to the risk measure adopted. Nearly identical results were found for the R & D/BV and AD/BV coefficients irrespective of whether the Ben-Zion and Shalit or stock-price beta measure was adopted.

[5] Only the total of national spot and network television advertising will be considered below since rates for *national* television ads vary little between the spot and network categories [see 16].

[6] Of course, δ's would rise substantially if growth rates for *real* as opposed to *nominal* expenditures were adopted. Growth rates for nominal expenditures were used in order that resulting δ's could be interpreted in terms of historical rather than replacement costs. This should facilitate comparisons of the results reported here with previous studies, as well as with common accounting data and standards.

to have positive effects on market value, only the television advertising effect is statistically significant (and highly so). Therefore, the case for treating television advertising as intangible capital is far stronger than that for other types of advertising promotion. Given a recent 13.1 percent rate of growth in television advertising, an average depreciation rate of 21.1 percent per year is indicated. Thus, somewhat lower depreciation and a longer economic "life" is suggested for television advertising than for advertising in general. These results are consistent with previous suggestions concerning the superior effectiveness of television advertising (see [10], [14], [19]). A lesser depreciation rate for television advertising may be explained by the fact that television advertising addresses a diverse and broadly distributed population where rates of potential customer turnover can be lower than for other forms of media promotion (see [16]).

The reader must exercise caution in interpreting the advertising and R&D depreciation rate estimates developed above. First, they are interfirm averages and could tend to vary according to the type of buyer addressed (consumer goods versus producer goods) as well as according to a firm's technological environment (or technological opportunity). Second, as Peles has pointed out, advertising depreciation will tend to be lower for large as opposed to small firms because larger firms address a larger and therefore more geographically stable audience. And third, with high inflation economic depreciation rates will be lower than in a stable price environment due to "replacement cost" effects. Thus, advertising and R&D depreciation rates will tend to be lower during the highly inflationary environment experienced in the late 1970's (our sample period). On balance, the depreciation rates estimated above should only be taken as rough estimates and may be somewhat less than "true" economic depreciation rates.

And finally, the findings reported here may have important public policy implications. From equation (6a) we see that R&D capital will be roughly two and one-half times current expenditures and advertising capital will be roughly three times current levels of advertising. In light of current (1977) R&D and national media advertising expenditures of $15.2 and $5.0 billion, the stock of intangible capital enjoyed by *Fortune* 500 firms is estimated at $47.8 billion for R&D and $13.8 billion for advertising. If only television advertising is considered (using equation (6b)), the *Fortune* 500 stock of intangible capital due to advertising falls to $12.4 billion. On an overall basis, total 1977 private R&D and national media advertising expenditures indicate an accumulated national stock of $54.7 billion in R&D capital and $57.6 billion in advertising capital (using equation (6a)). Again, care must be taken in interpreting these admittedly rough estimates (see above). Nevertheless, the total stock of intangible capital may be quite substantial. As pointed out by several authors (e.g., [21]), tax laws which permit an expensing of capital items result in substantial tax subsidies for affected firms. Currently, the

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annual tax subsidy for expensing versus capitalization will generally equal 38 percent of the amount of net investment per year.[7] While eliminating such tax subsidies could prove formidable, Weiss has suggested that conservative depreciation guidelines for intangible capital could be established which prudently err on the side of short lives as they currently do for tangible capital. He states that such a change should improve the equity of the tax system and the accuracy of corporate accounts.[8] The results reported here seem to support this view.

IV. CONCLUSIONS

This paper considers the intangible capital aspects of advertising and R&D expenditures through use of a market valuation approach. An empirical analysis finds that, on average, advertising and R&D expenditures have positive and significant market value (intangible capital) effects. Admittedly rough average depreciation rate estimates for advertising are in the 20 to 30 percent range, while an average R&D depreciation rate of approximately 25 percent is indicated. However, because the intangible capital effects of advertising may stem from medium-associated influences of television advertising, the expensing versus capitalization issue is far from clear cut. Generally allowing firms to capitalize and depreciate both advertising and R&D expenditures is only appropriate to the extent that finding consistent future effects on average provides sufficient motivation. While such a tax policy would be consistent with current treatments of various classes of tangible capital investment, a more precise policy would be to require the capitalization of television advertising and R&D expenditures, but withhold a decision concerning capitalization of other forms of advertising until the duration of their influences is understood more fully. Furthermore, it may prove interesting in future re-

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[7] This can easily be shown. Consider the following notation:

S = Annual tax subsidy due to use of expensing versus capitalization option.
T_E = Annual tax using expensing option.
T_C = Annual tax using capitalization option.
I = Annual net investment in intangible capital.
π = Annual accounting profit before net intangible capital investment.
m = Marginal tax rate.
c = Investment tax credit rate.

If $T_E = m(\pi - I)$ and $T_C = m\pi - cI$, an annual tax subsidy from expensing $S = T_C - T_E > 0$ will arise so long as $m > c$. Under current tax law $m = 48$ percent and $c = 10$ percent. Thus, the tax subsidy to expensing versus capitalization is 38 percent of annual net investment in intangible capital since:

$$S = T_C - T_E,$$
$$= m\pi - cI - m(\pi - I),$$
$$= (m - c)I,$$
$$= (.48 - .10)I,$$
$$= .38I.$$

[8] Accounting errors can create obvious obstacles to industrial organization research. For example, accounting errors relating to advertising depreciation make it difficult (if not impossible) to learn whether price-cost margin effects of advertising reflect intangible capital or barrier to entry type influences (see [11]).

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search to also inquire whether or not rates of advertising and R&D deprecia-
tion tend to vary over time or across industries. An obvious implication of
findings reported here is that further investigations of the topic may be well-
worthwhile.

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